

EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

VOL. 82, NO. 5, PAGES 41-48

FEBRUARY 3, 1981

## GEOPHYSICIST

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## International Ocean Technology Conference

A call for papers has been issued for Oceans '81, an international ocean technology conference, scheduled for September 16-18 in Boston, Massachusetts.

Abstracts, due March 1, should be no longer than 400 words and should be structured in four sections: title and author; problems addressed, including background; procedure applied; and results and conclusions. Abstracts must be in English and should accompany a brief biographical sketch of the author(s). Papers may be presented in a lecture or in a poster session.

Authors of papers selected for presentation will be notified by mail by April 1. Camera-ready papers are due June 1. Abstracts and biographical sketches should be sent to:

Oceans '81 Technical Program Committee, P.O. Box 182, Portsmouth, Rhode Island 02871. Additional information can be obtained from the above address or by writing James Baird, Committee Chairman, at (617) 481-1850.

The conference is sponsored by AGU, the IEEE Council of Oceanic Engineers, the Section of IEEE, the Marine Technology Society (MTS), the New England section of MTS, and the Southern New England section of MTS.

## Migration to the Shore

The Center for Coastal Studies at the Scripps Institution of Oceanography will sponsor an international symposium entitled "Quaternary Land-Sea Migration: Bridges and Human Occupation of Submerged Coastlines" on October 26-31. Marine archaeology and the migration of early man in the coastal regions of the world is one subject area being studied at the new center.

For additional information about the center or about the symposium, telephone Douglas L. Hansen, center director, 714-452-4334, or Patricia M. Masters, coordinator of the marine archaeology program, 714-452-2995.

## European Union of Geosciences

The first meeting of the European Union of Geosciences is scheduled for April 13-16 in Strasbourg, France. In addition to the regular sessions, several symposia will be held.

Symposia topics include basin evolution from heat flow to oil; episodic versus continuous geodynamic processes; continental development and structure; early development of the earth; European seismicity and earthquake prediction; paleoclimates; oilfields and greenhouse belts; and magma generation and segregation.

Travel grants will be awarded for submission of high-quality abstracts.

For information on registration, abstract submission, housing, and awards, write to European Union of Geosciences, Organizing Committee, Institut de Physique du Globe de Paris, Université Paris VI, 4 Place Jussieu, 75230 Paris, Cedex 05, France.

# EOS

TRANSACTIONS, AMERICAN GEOPHYSICAL UNION  
The Weekly Newspaper of Geophysics

*Eos* invites contribution of reviews, short articles, meeting reports, news notes on recent research, and letters to the editor. Material must be readable, contain little or no mathematics, be of broad interest to scientists in the various disciplinary sections of the Union, and be timely.

*Eos* also welcomes contributions dealing with the interfaces of geophysics with society. This newspaper is an effective way to address those involved in the study of the earth and its environment in space.

Send double-spaced manuscripts (four copies) to *Eos*, AGU, 2000 Florida Avenue, N.W., Washington, D.C. 20008, or send them directly to one of the associate editors with a copy to the above address.

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*Eos*, Transactions, American Geophysical Union (ISSN 0098-3941) is published weekly by the American Geophysical Union from 2000 Florida Avenue, N.W., Washington, D.C. 20008. Subscription available on request. This issue \$5.00. Second class postage paid at Washington, D.C., and at additional mailing offices.

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## AGU Congressional Science Fellowship

The individual selected will spend a year on the staff of a congressional committee or a House or Senate member, advising on a wide range of scientific issues as they pertain to public policy questions.

Prospective applicants should have a broad background in science, be articulate, literate, flexible, and able to work well with people from diverse professional backgrounds. Prior experience in public policy is not necessary, although such experience and/or a demonstrable interest in applying science to the solution of public problems is desirable.

The fellowship carries with it a stipend of up to \$25,000 plus travel allowances.

Interested candidates should submit a letter of intent, a curriculum vitae, and three letters of recommendation to AGU. For further details, write Member Programs Division, Congressional Fellowship Program, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, D.C. 20009.

Deadline: March 31, 1981.

**Cover.** An Apollo view of the moon's 11-km-diameter crater, Goddard A, and associated swirl patterns. The swirl patterns are unlike typical crater rays, which become brighter at larger phase angles. One proposal by P. H. Schultz and L. J. Brink suggests that they represent imprints of the late-scale structure of the inner cone of a comet (Nature, 284, 1980). The collision of these swirl patterns thereby producing the unusual photometric properties. The correlation of each swirl pattern with strong magnetic anomalies might be explained by the compression of magnetic field lines that takes place within the cone during collision, and which is recorded by altered regolith materials. (Photo courtesy of P. H. Schultz, Lunar and Planetary Laboratory, Houston, Texas.)

## Editorial

### AGU Annual Meetings

The purpose of this editorial is to inform AGU members about the procedures for scheduling the annual meetings, to explain the role of the section program chairmen, and to emphasize the importance of timely submission of abstracts.

The dates and locations for the annual meetings are set by the AGU Council, based on recommendations from the Meetings Committee. In making these recommendations the Meetings Committee considers the suggestions of AGU members and reviews possible sites on the basis of facilities, costs, convenience to transportation, probable weather conditions, number of local AGU members, and general attractiveness of the host city. The choice of meeting dates as well as the location is heavily influenced by hotel costs since the rates which can be negotiated with the hotels depend on the expected demand for hotel rooms. Thus, this year, the Spring Meeting is scheduled for the week that includes Memorial Day, when business travel and hotel demand is reduced. In the past it has sometimes been necessary to schedule the meeting to straddle a weekend in order to obtain lower hotel rates. The inconvenience of meeting on weekends and holidays is recognized, but it is felt that the cost savings achieved in this way are essential. The point to be emphasized is that the selections are not made lightly, and the Meetings Committee, the AGU staff, and the AGU Council make a thorough evaluation of potential sites and dates before making a decision.

Once the dates for an AGU meeting have been decided, the overall scheduling, which includes setting the date for the call for papers, the abstract deadline, the program chairmen's meeting, and the mailing of the program in *Eos*, is derived by considering the time required for completing these various steps. Recognizing the desirability of having up-to-date abstracts, the abstract deadline is set as late as possible. However, this tactic necessarily limits the time available for all subsequent steps in arranging the program.

These factors conspire to place a severe burden on the section program chairmen in planning the programs. These chairmen are responsible for organizing special sessions, grouping the contributed abstracts into coherent sessions, selecting session chairmen, and scheduling the time and room assignment of each session. A section program chairman has approximately 2 weeks between his receipt of on-time abstracts and the program chairmen's meeting. At the program chairmen's meeting, which typically takes 2 days, the entire program is completed, meeting rooms are assigned, and efforts are made to minimize conflicts between

various sessions. At this time, abstracts that may have been misdirected are transferred to the proper section program chairmen. Throughout the 2-week period between abstract deadline and the chairmen's meeting, the continuous arrival of late abstracts can disrupt the work of these chairmen. In some cases a chairman has arrived at the program meeting with his program completely organized but is confronted with an additional 20 to 30 late abstracts. These abstracts cover a multitude of subjects and cannot be grouped into a single session. Adding them to existing sessions will extend those sessions unduly. The net result is that the program chairmen are forced to reorganize his entire program on short notice during a time when he is busy with the other affairs of the program meeting.

The problem of the late receipt of abstracts is a serious one. In 1978, fully 60% of the abstracts arrived after the meeting deadline. To help alleviate the situation a \$25.00 penalty was assigned to abstracts that arrived late. At the 1980 Fall Meeting, only 17% of the abstracts were received late, but this figure is still inconveniently large. While it is recognized that the deteriorating U.S. Postal Service is partly responsible, assigning blame to a federal agency does not reduce the difficulty of processing late abstracts. I urge you to make every effort to mail abstracts early enough to ensure their timely arrival or send them by more expensive but reliable services such as Federal Express.

The AGU annual meetings have been growing steadily in both attendance and number of papers presented, and the meeting facilities available at most cities are now barely adequate. Furthermore, the large numbers of papers make simultaneous sessions necessary for most sections. To make the meetings more manageable and productive, there will in the future be increased emphasis on poster sessions and a rigid enforcement of the limit of one first-author contributed paper per member. In addition, more topical conferences and symposia will probably be held to supplement the annual meetings.

The vitality of the annual meetings is a major factor in the health of geophysical research. The Meetings Committee, the program chairmen, and the AGU staff are receptive to suggestions from the membership that can lead to more effective meetings. With the growth in attendance and in contributed papers it will be necessary for the meeting structure to evolve, and your help in suggesting changes will be appreciated.

Martin Wall  
Meetings Chairman

## News

### Fiscal 1982 Budget Highlights R&D

Geophysical research and development programs show growth beyond inflation in the \$739.3 billion budget for fiscal 1982 that Jimmy Carter sent to Congress 5 days before completing his term. Included in the budget are provisions for increased support for the Ocean Margin Drilling Program and funds for an Interagency Geological Applications Program, funds for an agriculture and resource survey program that relies on remote sensing, and funds for the Venus Orbiting Imaging Radar mission.

Ronald Reagan is expected to make changes in the budget as early as late February, although in mid January the heads of the scientific agencies could not characterize possible changes. Some Washingtonians say sharp cuts are inevitable, with basic research a prime candidate. Others, however, contend that the Reagan administration's push for productivity and innovation could prevent severe carving. *Eos* will track the FY 1982 budget changes through congressional approval.

### R&D Shows Real Growth

Obligations, or commitments of monies (not actual outlays) for conduct of all federally funded R&D total \$41.7 billion for fiscal 1982, an increase of \$8.6 billion or about 18.5% over 1981 obligations (Table 1). With the inflation rate at about 10%, the proposed budget shows real growth for R&D of about 8.5%. Within the R&D budget, obligations for basic research show a 14.4% increase (Table 2). Biggest increase for basic research among the agencies fell to NASA. Funds for conduct of R&D at universities and colleges barely escaped severe inflation, with an 11.3% increase (Table 3).

The National Aeronautics and Space Administration (NASA) total budget fared well with an increase of 21% over 1981. Among federal agencies, this increase—to a \$8.7 billion purse—is second only to that for the Defense Department's proposed total budget.

NASA R&D obligations show a 21.5% increase over those of 1981. Over \$2.2 billion, or about half of NASA's R&D request, is slated for the space shuttle. The shuttle is the centerpiece of NASA's civil and military space efforts throughout the 1980s, according to Robert Froeh, former NASA Administrator. The first orbital flight is scheduled for March, with three more test launches in 1981 and 1982. The first operational flight will follow in late 1982.

Another highlight of the NASA budget is \$40 million for the initiation of the Venus Orbiting Imaging Radar (VOIR) mission (*Eos*, December 2, p. 1202). One VOIR spacecraft, scheduled to be launched from the shuttle in 1986, will

probe Venus' dense cloud cover to discover more about the planet's geophysics and atmosphere.

Request for development of the Gamma Ray Observatory (GRO) nearly triples over 1981's \$17.6 million. GRO will be launched in 1986 to study objects in the universe in the gamma ray spectral region. Fabrication work will also continue on the International Solar Polar Mission; the 1982 budget request of \$58 million is a 46% increase over the previous year.

TABLE 1. Federal R&D Obligations by Agency (Millions of Dollars)

Agency	FY 1980	1981 est.	FY 1982 est.	Change 1981-82
DOD-Military	13,943	16,228	20,033	+ 23.5%
NASA	5,084	5,422	6,589	+ 21.5
DOE	4,737	5,187	5,642	+ 9.2
HHS	3,790	3,984	4,285	+ 8.1
NSF	888	1,015	1,157	+ 14.1
USDA	887	775	871	+ 12.3
Interior	438	485	498	+ 8.7
DOT	374	413	474	+ 14.8
Commerce	341	365	411	+ 12.8
EPA	348	364	345	- 5.2
Labor	215	153	330	+ 116.0
All Others	839	897	1,102	+ 22.8
Total	31,682	35,226	41,734	+ 18.5.

Source: Office of Management and Budget

TABLE 2. Federal Basic Research Obligations by Agency (Millions of Dollars)

Agency	FY 1980	1981 est.	FY 1982 est.	Change 1981-82
HHS	1,788	1,887	2,063	+ 8.8%
NIH	(1,839)	(1,768)	(1,909)	+ 8.6
NSF	812	923	1,057	+ 14.4
DOE	523	581	710	+ 20.1
DOD-Military	539	605	704	+ 16.8
NASA	569	555	681	+ 22.8
USDA	276	322	367	+ 14.1
All Others	215	239	289	+ 21.3
Total	4,682	5,121	5,881	+ 14.4

\*An additional \$75 million in new funding is included under R&D facilities for NSF for modern scientific apparatus and facilities to support basic research at universities.

Source: Office of Management and Budget.

(News cont. on page 50.)



(News cont. from page 49)

TABLE 3. Federal R&D Obligations to Universities and Colleges by Agency (Millions of Dollars)

Agency	FY 1980	FY 1981 est.	FY 1982 est.	Change 1981-82
HHS	2,076	2,165	2,354	+ 7.8%
NIH	(1,897)	(2,011)	(2,150)	(+ 7.4)
NSF	966	791	988	+ 14.1
DOE-Military	451	528	639	+ 21.0
DOE	293	312	351	+ 12.9
USDA	221	241	263	+ 17.4
NASA	171	188	204	+ 8.5
All Others	312	326	353	+ 8.1
Total	4,190	4,541	5,053	+ 11.3

Source: Office of Management and Budget

Budget obligation for the Galileo mission to Jupiter swelled 71% to \$108 million. Fabrication work will continue in FY 82 in preparation for separate launches, planned for 1985, of the mission's two major components. The halogen occultation experiment budget was raised 88% to \$7.5 million.

Upper atmosphere research will be expended in 1982 to test ground and space system studies and instrument design and testing for a future satellite mission to study the interactions among the chemistry, radiation, and dynamics of the upper atmosphere. \$20 million has been budgeted for these experiments.

#### NSF: \$75M To Improve Labs

The National Science Foundation (NSF) obligations for research and development in fiscal 1982 were boosted 14% to \$1.18 billion. The big winner is a new program to upgrade end modernize university research instrumentation; NSF allocated \$75 million to the program. Up to 120 awards, one per institution, will be made under the \$75 million program to upgrade instrumentation and facilities. This program aims to increase the productivity and efficiency of research groups. Another goal is to improve the return on investment of federal research support funds.

Cooperative industry/university research projects also get a large boost in fiscal 1982. NSF has obligated \$26.8 million, nearly double the 1981 level. NSF-sponsored basic research will get \$1.06 billion in 1982, 15% above 1981's funding level. Highest increases in basic research are allocated to the mathematical and physical sciences, to engineering, and to the social and economic sciences.

Funds to initiate construction of a 25-m, millimeter wave telescope on Mauna Kea, Hawaii, are included in the NSF purse. Complete design and initial fabrication, scheduled for fiscal 1982, will require \$9.8 million. Approximately the same level of funding is expected for the following two fiscal years; installation of the telescope is scheduled for 1984.

Obligations for ocean drilling programs grow by 38.4% over 1981's obligation of \$22 million; NSF has requested \$30 million. The Deep Sea Drilling Project (DSDP) and the International Phase of Ocean Drilling (IPOD) together garner \$14 million, down \$3 million. The Ocean Margin Drilling Program (OMDP) is budgeted for an additional \$11 million over 1981, bringing NSF's share in the program to \$16 million. An identical amount will be allocated by U.S. petroleum companies. Planned for fiscal 1982 is the initial implementation phase, including detailed design, advance planning, and long-lead-time procurement.

The Astronomical, Atmospheric, Earth, and Ocean Sciences Directorate shows real growth of 3.5%, with a budget obligation of \$268 million.

In terms of real growth, the U.S. Antarctic Program will shrink by about 2%; the overall 8% increase does not cover the calculated rate of inflation. NSF has requested \$70.1 million for the program. Cutsback at Siple Station (Eos, November 11, p. 906) were caused by increased fuel costs.

Support of applied research programs shows no real growth above inflation in fiscal 1982. Funding increased 10.9% to \$90.2 million.

#### NOAA Expands Acid Rain Research

The National Oceanic and Atmospheric Administration (NOAA) has been allocated \$1.05 billion of the federal budget, an increase of 23.7% over 1981. NOAA lured better than the Department of Commerce as a whole. Ocean and atmospheric services are slated for 42.7%, or \$448.1 million, of NOAA's budget; the satellite programs' share is \$274.8 million (26.1%), followed by fisheries (\$151.8 million or 14.4%), research and development (\$129.5 million or 12.3%), and coastal zone management (\$46 million or 4.4%).

Support will be expended for acid rain research and on improved methods of detecting, tracking, and forecasting weather systems and violent storms.

Much of NOAA's increase is reflected in the transference of LANDSAT to the environmental satellite services division; NOAA is now the lead agency for all civilian satellite operations. The 1982 budget request includes \$122.4 million for first-year costs of the Interim LANDSAT system. Total budget increase for the environmental satellite service is 181% over 1981.

Specialized environmental services showed a 4.1% increase to \$46.8 million, but within it the air pollution and live weather services jumped 48% to \$5.7 million. This increase is the result of expanded research, planned to investigate acid rain pollution. This research received an additional \$1.8 million over the 1981 funding level.

Other divisions of NOAA did not even keep up with inflation in the proposed budget. Basic environmental services increased 5.9% to \$188.4 million. Public forecast and warning services increased 7.4% to \$101.3 million, all reflected in one program. Public weather services increased \$7 million to \$59.6 million.

NOAA's budget provides for the continued operation of the two weather satellite systems and the development of an ocean satellite system. No funding is proposed, however, for coastal energy impact formula grants or for coastal environment grant and credit assistance in fiscal 1982.

One new responsibility NOAA takes on in fiscal 1982 is to license and regulate ocean thermal energy conversion (OTEC) and deep seabed mining.

#### USGS Budget Sliced by 9%

The fiscal 1982 budget request pares the U.S. Geological Survey (USGS) funds by nearly 9%, to \$575.8 million. Research priorities within the survey include investigating the causes and effects of geologic and environmental hazards such as earthquakes, volcanoes, ground failure, acid rain, and toxic wastes.

Increases in the office of geologic and mineral resource surveys and mapping will provide for growth of the earthquake program. Development of a system to monitor continuous strain in southern California is included in this category. In addition the USGS will initiate two programs: one will coordinate a research program in landslide hazards warning and mitigation, and the other will research deep continental crust.

Under the water resources investigations office, the USGS will initiate a program to research the effects of acid rain. The NOAA and USGS programs in acid rain pollution are an attempt to understand and quantify the phenomena. The water resources office will also initiate a program on the prevention and mitigation of groundwater contamination. Despite these program inclusions, the office's budget doesn't beat inflation; funding increases only 5.8% to \$25.7 million.

The Water and Power Resources Service, another part of the Department of the Interior, shows an increase of 13.5% to \$913.5 million in fiscal 1982 obligations.

#### Budget Includes Interagency Programs

Three interagency programs budgeted for fiscal 1982 directly involve geophysics. A new program, the Geological Applications Program (GAP), with budget obligations totaling \$19 million for 1982, will coordinate research activities among the USGS and NASA. Measurement techniques based on remote sensing developed by NASA will be tested in mineral appraisal projects conducted by the survey. NASA and USGS geologists will jointly develop new models and analyze remote sensing and ground truth data to provide an overall evaluation of the utility of space techniques for mineral resource assessment. NASA will contribute \$10 million.

The second interagency program, dubbed AgRISTARS (Agriculture and Resource Inventory Surveys Through Aerospace Remote Sensing), is a continuing program designed to assess the value of space remote sensing data for early warning of crop conditions and for improving worldwide agricultural production forecasts. Participating in the program are the Agriculture, Commerce, and Interior departments; NASA; and the Agency for International Development. Obligations total \$54 million.

The third program, the National Oceanic Satellite System (NOSS), will continue as a joint effort of NASA and the Department of Defense and Commerce. This satellite system will provide global ocean data for use in marine weather forecasting and climate studies, marine transportation, and defense applications. Obligations in fiscal 1982 are slated at \$95 million.—BTS

#### Data Systems Users Working Group

A Data Systems Users Working Group (DSUWG) has been formed, at the request of NASA's Office of Space Science (OSS), by members of the space science community concerned with improving the yield, significance, and pace of scientific output from the massive, and growing, data base generated by spacecraft observations. The first meeting of the DSUWG was convened at Marshall Space Flight Center (MSFC) on September 11 and 12, 1980, by chairmen James L. Green (MSFC) and Eugene W. Greenfield (TRW). Most of the attendees of the first meeting were investigators long occupied with handling large data sets or coordinating measurements of separate but related space plasma variables. This particularly included members of the Atmosphere Explorer (AE) team.

The meeting was organized around a series of talks that included descriptions of past and future data networks at both the institutional and national level. Representatives from MSFC described the data-based management system of the NEEDS (NASA End-to-End Data System) program, and representatives from Goddard Space Flight Center outlined the present state of standardization of computer network protocol. Discussion focused on the general state of past space science data bases, on the likely forms and problems of future data bases, and on the means of applying state-of-the-art manipulation techniques to expedite reduction and analysis of spacecraft data. Attention was directed particularly to the necessity of facilitating data communications and exchange between investigators and remote data sources via compatible computer networks comparable to those currently in routine use by banks, airplanes, and commodity traders.

The working group conferred on a statement of concern and a set of broad recommendations to be forwarded to NASA/OSS in order to encourage early adoption by the agency of measures designed to modernize and strengthen the nation's efforts at turning the accumulated and planned observational records into meaningful scientific conclusions. The DSUWG then organized itself into four subgroups to examine in detail the elements and implementation of an advanced data processing and distribution system. The subgroups and their chairmen are:

Core Data Standards	C. P. Sonati (Univ. of Arizona)
Networking and Communications Standards	R. Gold (Applied Physics Lab, Johns Hopkins Univ.)
Hardware/Software	J. Oounnik (Utah State Univ.)
Policy Management	R. Healey (Univ. of Texas, Dallas)

Space science investigators interested in contributing to the deliberations of the DSUWG should contact the chairman of the subgroup closest to their interests or either of the cochairmen of the working group.

The recommendations sent to NASA by the working group follow.

#### Recommendations

The DSUWG recognizes that correlative studies are now, more than ever, impeded by the inability of different institutions to efficiently manage and transfer data from one location to another in a timely fashion. The large volume of data obtained in the 1970's by each investigation should have required early scientific involvement and data-based management, which, except for the AE project, was generally not undertaken. In an effort to prevent this problem in the future, the DSUWG therefore recommends that NASA

- establish and reflect, through its internal organization, an explicit policy that scientific data management is a major concern of the agency;
- dedicate the requisite resources for planning and sustaining the flow of data through all phases of the data chain, from conception of a mission to conclusion of the data analysis;

- authorize the involvement of scientific investigators in all stages of the data chain, including system design, implementation, and utilization, and ensure the flexibility to modify the system according to data processing requirements;
- support and direct the application of advanced technology to the creation of facilities for sharing the processing, transmission, storage, retrieval, and analysis of data in a commonly accessible and timely manner, both within and across mission and institutional boundaries.

The DSUWG also urges further study within the working group and NASA to explore and to help define details of standardization, protocol, communication, and operations necessary in order to implement the recommendations at the fastest practical pace. Worldwide standards of computer interchange are being devised; NASA should ensure that these standards are followed when confirmed and that internal systems be compatible as far as possible.

It is time to manage better the large quantities of existing and future space science data and provide the capability for easy access. It is foreseen that if these recommendations are properly implemented, enormous benefits are to be derived within the space science community.

This item was prepared and submitted by E. W. Greenfield of the Space Sciences Department, TRW Defense and Space Systems Group.

#### Johns Hopkins Site of Space Institute

The Space Telescope Science Institute (STSI) will be located on the Homewood Campus of the Johns Hopkins University, Baltimore, Maryland. The institute will perform critical mission science activity for the forthcoming space telescope mission. The 13.1-m spacecraft is to be placed into a 600-k-high orbit by the space shuttle, and it will perform scientific investigations for at least 15 years.

The Association of Universities for Research in Astronomy (AURA), a consortium of 14 universities, has been selected for the negotiation of a contract to establish, operate, and maintain STSI for the space telescope scheduled for launch in early 1985 on the space shuttle. The contractor's estimated cost for the initial 5-year contract is approximately \$24 million. Additional funding will be required in support of a guest observer and archival research program, as it develops. The contract will contain options for three additional 5-year extensions.

The institute will host American and foreign astronomers, who will come to the facility to use the space telescope much as they would use a ground-based observatory. The telescope's science data will be sent via a tracking and data relay satellite and the NASA communications network to the Goddard Space Flight Center, Greenbelt, Md., and then on to the institute for use by the staff and guest scientists. Investigators will be able to ask controllers at Goddard to point the spacecraft at any desired field of view.

The institute will establish space telescope science observation schedules, fund United States user participation, and provide direct technical support to observers before, during, and after their observations. It will also support research necessary for efficient use of the telescope; evaluate its scientific performance and advise NASA on instrument status, and process, archive, and publicize the telescope's findings.

The institute will staff and operate the Space Telescope Support Center at Goddard. This is essentially the section of the Operations Control Center that makes observational requirements with practical spacecraft flight and control considerations.

Above the obscuring atmosphere, the space telescope's 2.4-m mirror will be able to observe 350 times the volume of space now visible from ground-based observatories. The combination of high resolution, increased sensitivity, and relatively large aperture should facilitate observation of objects 60 times fainter than can be seen from Earth. The facility can also be used for measurements of the ultraviolet region of the spectrum, which is mostly absorbed by Earth's atmosphere.—PMB

#### Cost Overruns Will Affect Galileo Mission

Recent news of the cost overruns in the development of the shuttle's upper stages that will affect launching of the proposed Galileo mission prompted the following statement from Robert A. Froeh, on the eve of his resignation from the post of NASA Administrator:

You know that we have been carrying out a concentrated study of Shuttle upper stages for 2 1/2 months now. This study was initiated in early November when we became concerned with the continued rapid escalation of estimated costs for the three-stage IUS (inertial upper stage). We have decided on the best course of action for the future, and I want to outline for you how I believe the nation should proceed.

To outline the situation we are in now, there is a very low probability that we can prepare a three-stage IUS in time for Galileo orbiter and probe launches to Jupiter in 1984, as previously scheduled. Therefore, the budget that the President is sending to Congress provides funding for that mission in 1985. The three-stage IUS, if it could be developed by 1985 along the lines we have been following, could not accomplish the Galileo mission because of the high energy requirements in that year.

While it would be possible with a different IUS vehicle, not now under development, to launch the Galileo orbiter, the trajectory would take about 5 years from the 1985 launch to reach Jupiter. The probe would then be launched in 1988 by the same vehicle, but this would make a great departure from our planetary program and would necessitate an unacceptably long gap in the scientific data that we achieve from these missions. The cost of both the planetary programs and the IUS would rise sharply with such an option.

Now, as you know, we have also been working with the industry to look at the possibility of incorporating the Centaur stage into the Shuttle, an option that has been extensively studied and has frequently been proposed as an alternative to the three-stage IUS. I have concluded that within the 1981 and 1982 resources that the budget would provide we could begin modifications of the Centaur, provisions for integrating it with the Shuttle, and the relatively minor changes to launch facilities at the Cape (Kennedy Space Center, Fla.) so as to have that very powerful combination available for first launch in 1985. No other alternative upper stage is available on a reasonable schedule or with comparable costs. The Shuttle/Centaur would satisfy our planetary mission needs and would offer, both to commercial customers and to national security interests, a highly capable launch vehicle with growth potential.

Therefore, NASA will expand discussions with the Air Force on the best means for providing upper stages to meet the needs of the nation in the second half of this decade and work with them to continue with development of the two-stage IUS, which both we and the Air Force are counting on for a number of critical missions. We will also make preparations with the General Dynamics Corp. (St. Louis, Mo.) to enable us to enter into a contract this spring for integration of the Centaur vehicle in the Shuttle for the 1985 Galileo and ISPM (International Solar Polar Mission) launches.

Of course, significant changes of this magnitude in our plans will be subject to confirmation as the Administration changes. Pending review of NASA's recommendations by the new Administration and the Congress, NASA will work with the Air Force to permit orderly implementation of the Space Transportation System and our respective programs. —PMB

#### Einstein Observatory Resumes Operation

The orbiting Einstein Observatory has returned to full-time scientific operation after an onboard gyro that failed last August inexplicably came back to life, according to controllers at the Goddard Space Flight Center, Greenbelt, Md. First indications of maneuvering problems in the X-ray observing satellite were noted last August, limiting the observatory's scientific investigations. During the following 8 weeks, ground controllers modified radio command instructions to the spacecraft, allowing them to bypass the troubled gyro and continue operations with the two remaining gyros. Since mid-October, controllers had attempted repeatedly to reactivate the faulty gyro by sending literally thousands of radio commands to the ailing subsystem, with no effect.

For reasons not yet fully understood, the inactive gyro began to function normally on December 6, and the spacecraft was able to resume normal operations. The satellite, known officially as the High Energy Astronomical Observatory (HEAO-2), was launched November 13, 1978. It was nicknamed 'Einstein' by the scientists involved in the mission, in honor of the proximity of its launch date to the 100th anniversary of Einstein's birth.

Designed for an operational life of 1 year, the observatory has operated for more than 2 years and is expected to continue

for several months before its propellant supply is exhausted. In its more than 2 years of operation, the satellite has returned thousands of X-ray pictures, which will provide scientists a better understanding of X-ray activity in space and new clues to the origins of galaxies.—PMB

#### Geophysicists

Philip S. Juetas has joined the Nuclear Regulatory Commission as a staff geologist in the Geoscience Branch, Division of Engineering, Office of Nuclear Reactor Regulation, which is based in Bethesda, Maryland.

Debra Laura has been appointed chief of the U.S. Geological Survey's Office of International Hydrology. She had been the assistant chief of that office since July 1979.

Barnay P. Popkin joined Darnas and Moore in Houston as senior hydrologist in January. He was formerly on the staff of the University of Arizona's Environmental Research Laboratory.

Frank Press, director of the Office of Science and Technology Policy under President Carter, has been selected as the 19th president of the National Academy of Sciences. His 8-year term begins July 1. Press was president of AGU 1974-76, is a Fellow of AGU, and was the 1979 recipient of the William Bowie Medal.

#### Geophysical Events

This item comprises selected portions of *SEAN Bulletin*, 6(12), Dec. 31, 1980, a publication of the Smithsonian Institution.

#### Volcanic Activity

Mount St. Helens Volcano, Cascade Range, Southern Washington, USA (48.20°N, 122.18°W). All times are local (GMT - 8 h). Renewed dome growth took place at Mt. St. Helens in late December, without the large explosions that immediately preceded previous dome-building episodes in June, August, and October.

Activity was limited to minor seismicity and weak vapor emission for about a month after the October 16-18 explosions and dome extrusion. Frequent periods of very low level harmonic tremor, lasting a few minutes to several hours, began to appear on seismic records November 19. Bursts of higher-level tremor, similar to explosion events seen earlier at Mt. St. Helens, could often be correlated with ejections of vapor columns that sometimes contained ash. A few discrete shallow earthquakes were recorded but remained infrequent until late December.

A series of vapor plumes marked the volcano's behavior throughout much of December. A few minutes of stronger tremor accompanied emission of a vapor plume that rose to 3-km altitude December 7, and one of several bursts of higher-amplitude tremor on December 9 occurred as a plume was ejected to 2.7-km altitude at 1325. A new thin deposit of ash was noted on the upper south flank early December 12. Emission of this ash was not observed, but a burst of increased tremor had begun at 0417, lasting about 30 min. On December 13 at 2017, a plume reached 5.5-km altitude as higher-level tremor was recorded. Inspection of the dome December 15 revealed a new small crater in its southern edge. Adjacent to the new crater, a roughly triangular section of the dome had been removed, extending about 15 m along its outer edge and 30 m toward the center of the dome. Plumes associated with increased tremor rose to 3.3-km altitude December 16 at 0800 and December 17 at 1520. A plume reaching 6-km altitude was briefly visible through clouds on December 21 at 1409, accompanied by a short burst of tremor. Two days later, at 1258, seismic activity and vapor emission increased simultaneously. Gas and a little tephra rose to almost 3 km, but activity continued for only a few minutes. New crater floor cracks were apparent after this event.

Deformation measurements December 8 and 9 showed a halt or possibly a reversal of the outward movement of the northern crater rampart that had resumed in November. Measurements December 18 revealed little or no change. However, observations on the 23rd showed renewed northward displacement of the northern crater rampart. Features in the crater floor appeared to be widening as well as extending radially from the inner crater.

On December 25 the number of discrete shallow earthquakes began to increase. Seismically peaked before noon December 27, averaging five events per hour and occasionally reaching eight per hour during the next 30 hours. Geophysicists at the University of Washington located about two dozen of these events. All were centered at 2-km depth or less and were within 1 km NW of the October dome. No migration of events was evident.

Aerial observations December 28 were hampered by poor visibility, but there were no apparent changes in the crater. Bad weather prevented additional observations of the crater until December 28 at 0900 when U.S. Geological Survey and U.S. Forest Service personnel saw a new extrusion about one quarter the size of the October dome and emerging from its southeast edge. A plinianic structure protruding 30-80 m from the center of the October dome was noted an hour later. All but 6 m of this structure toppled the next day at 1540. Growth of the new southeast lobe and another, much smaller new lobe on the northwest edge of the October dome had apparently stopped by January 3, but crater floor deformation has continued (see below). The southeast lobe measured at least 225 m in an east-west direction and reached a maximum height of about 100 m above the crater floor, although by January 6 the crest was subsiding somewhat. The northwest lobe was about 100 m across. By comparison, the elliptical October dome was about 230 m in largest horizontal dimension and 80 m high on October 19. A collapse pit formed on the October dome during the growth of the new lobes, but the pit dimensions were not available.

Deformation measurements showed that the northern crater rampart had moved outward about 85 cm between December 23 and 28 and another 1.5 m by January 2. Since then, the crest of the rampart has been uplifted and thrust northward dramatically, as much as 5 m by January 8. Other thrusts have been observed in relatively level terrain on the crater floor.

By the afternoon of December 29, seismicity had declined to a rate of one or fewer events per hour. As of January 7, no harmonic tremor and very few discrete earthquakes were being recorded.

Information contacts: Don Swanson, Chris Newhall, and John Dvorak, U.S. Geological Survey Field Office, 301 E. McLaughlin, Vancouver, Washington 98663.

Steven Malone, Elliot Endo, and Craig Weaver, Graduate Program in Geophysics, University of Washington, Seattle, Washington 98195.

Robert Tilling, U.S. Geological Survey, Stop 908, National Center, Reston, Virginia 22092.

Krafla Caldera, Myvatn Area, Iceland (65.71°N, 18.75°W). By the end of November, inflation at Krafla brought ground level to the point at which previous deflation events and eruptions had been triggered. Ground level remained about the same until December 25 when 4 days of very slow deflation began. Total deflation was about one third the amount recorded during the October eruption. At the end of the deflation episode a swarm of small infrequent earthquakes was recorded, with epicenters about 10 km N of the caldera center. Inflation resumed on December 29, and by January 8 the calders had nearly returned to its predeflation ground level.

Information contact: Gudmundur Sigvaldason, Nordic Volcanological Institute, University of Iceland, Reykjavik, Iceland.

Sekurazima Volcano, Kyushu, Japan (31.35°N, 130.65°E). Explosions from the summit crater of Minamida began in October 1955 and were continuing at the end of 1980. The nine explosions in December brought the year's total to 278 (see Tables below), the largest number since 362 were recorded in 1974. (See *SEAN Bulletin*, 5(6) for a tabulation of monthly and yearly explosion figures since 1955). The highest December ash cloud rose 1.6 km on the 3rd.

Explosions from Sekurazima, December 1980

Date	3	5	10	13	18	20	23	Total
Number of explosions	1	2	1	2	1	1	1	9

Number of Explosions per Month at Sekurazima, January-December 1980

Month	Jan	Feb	Mar	Apr	May	June
Number	12	20	10	48	88	12
	July	Aug	Sept	Oct	Nov	Dec
	16	34	21	4	21	9
	Total 276					

Airshocks and tephra-fall from the explosions broke windows in buildings, automobiles, and aircraft; disrupted traffic; and interrupted electric power on occasion in 1980, but caused no injuries.

Information contact: Salsmological Division, Japan Meteorological Agency, 1-3-4 Otomechi, Chiyoda-ku, Tokyo 100, Japan.

Kulinoerabuzima Volcano, Ryukyu Islands, Japan (30.43°N, 130.22°E). The following from the Japan Meteorological Agency supplements the reports of the September 28 eruption of Kulinoerabuzima in *SEAN Bulletin*, 5(9).

After the 28 September eruption, which lasted for 1 1/2 hours, no additional eruptions had occurred as of the end of December.

Eight scientists from Kyoto University, Kagoshima University, and the Japan Meteorological Agency observatory arrived at the island on 1 October, installing portable seismometers at 5 sites. The next day, they climbed to the new fissure, which was 0.6-6.0 m wide and 750 m long, trending N-S near Shindeke crater (see Figure 1), active in historic times. A considerable amount of white vapor was emitted from the fissure.

The SW sector of the volcano was covered with gray ash, 1 m thick near the fissure and 2 cm thick at the base of the volcano, on the coast. Blocks were scattered N and W of the fissure, the largest block measuring about 2 m in diameter. No essential ejecta were observed. The volume of ejected material was estimated to be about 10<sup>5</sup> m<sup>3</sup>. Steaming decreased gradually during October, and was restricted to 10 small craters on the fissure by mid-October.

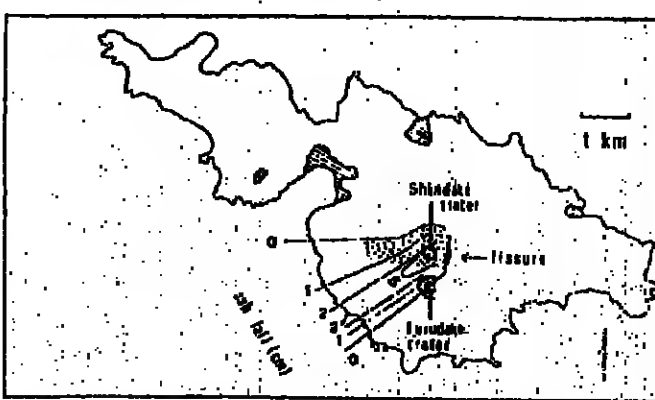


Fig. 1. Sketch map of Kulinoerabuzima Island, September 28, 1980. (Courtesy of the Japan Meteorological Agency.) Ashfall deposits are in centimeters. Blocks fell in the stippled area. Shaded zones are inhabited.

(News cont. on page 52)



(News cont. from page 51)

Seismicity was relatively weak in October and November except on 4 and 9 October when swarms of small S-type earthquakes were recorded (see Figure 2). The Japan Meteorological Agency's seismometer was removed on 15 November because the volcano was quiet. People on the island reported no felt earthquakes, and decreasing steam activity through December. Life returned to normal for the island's 300 inhabitants soon after the 28 September eruption.

Information contact: Same as for Sakurazima.

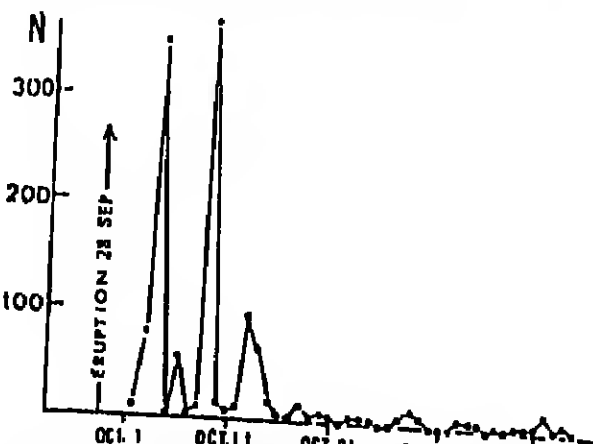


Fig. 2. Number of seismic events per day at Kulluobuzima, October 1-November 15, 1980. (Courtesy of the Japan Meteorological Agency.)

**Submarine Volcanos, Volcano Islands area, North Pacific Ocean.** The Japan Maritime Safety Agency (JMSA) continues frequent aerial monitoring of several known submarine volcanos (see Table 1). Renewed activity at Myojinsho was first observed from a fishing boat on November 15. Observations at Fukutoku-oka-no-ba, Minami-hiyoshi, and Fukujin April 24-October 21 are summarized in last month's *Bulletin*. Nikko, last seen active in July 1979, was not observed by the JMSA in November or December.

Information contact: Same as for Sakurazima.

TABLE 1. Volcanic Activity at Four Sites in the Volcano Islands Area, November-December 1980

Volcano	Nov. 14	Dec. 18	Dec. 23
Myojinsho (31.92°N, 139.92°E)	—	—	D
Fukutoku-oka-no-ba (24.28°N, 141.52°E)	D	—	—
Minami-hiyoshi (23.50°N, 141.90°E)	N	N	—
Fukujin (21.93°N, 143.47°E)	—	—	—

D—discolored water observed; N—no discolored water visible; —no overnight.

**Suwanosejima Volcano, Ryukyu Islands, Japan (29.53°N, 129.72°E).** Strombolian explosions have occurred almost every month since November 1956 from Otake, the highest point on Suwanosejima Island. Eruptive activity has typically lasted from one to a few days. The only damage from the 1980 explosions was caused by minor ash falls on crops. Between explosive periods, white vapor rose a few hundred meters above the vent.

Information contact: Same as for Sakurazima.

Date	Cloud Height, km	Activity
1979		
Dec. 18	0.3	three explosions
1980		
Feb. 5-9		about 10 explosions; incandescent column
Mar. 21-22	1.5	many explosions; ash fell on inhabited areas
Apr. 25-26	1.0	explosions; ash fell on inhabited areas
May 13	1.5	three explosions
May 18		six explosions; persistent ash ejection
Jun. 4-5	0.5	more than 25 explosions
Jul. 16-19	0.5	many explosions
Aug. 3-8	1.5	many explosions
Aug. 21-23	1.5	many explosions
Sep. 6-9	1.0	many explosions
Sep. 20	1.0	several tens of explosions; incandescent column
Sep. 24-27		more than 20 explosions; incandescent column
Oct. 25-27	2.0	more than 1000 explosions
Nov. 6-10	0.5	three explosions
Nov. 29	1.5	more than 1000 explosions
Dec. 13	0.5	persistent ash ejection

**Tarumai Volcano, Hokkaido, Japan (42.68°N, 141.38°E).** Seismic activity at Tarumai increased in November after about 1½ years of quiet (see Figure 3). The most recent eruptive activity, weak ash emission December 1978-May 1979, accompanied an increase in seismicity.

Information contact: Same as for Sakurazima.

**Mayon Volcano, southeast Luzon Island, Philippines (13.26°N, 123.62°E).** All times are local (GMT + 8 h). A moderate quantity of dirty white steam rose weekly to 200 m above the crater rim on December 4 at 1247, accompanied by short duration harmonic tremor on the Mayon Resthouse Observatory seismograph. Faint crater glow was first noted at 2315 the same day. Additional steam emission was observed December 12 and 14.

Harmonic tremor was first recorded at Mayon on August 16. Episodes of tremor and discrete earthquakes continued through December. Similar seismic activity preceded the 1978 eruption and accompanied crater glow in July 1979.

Information contact: Olimpio Peña, Acting Commissioner, Commission on Volcanology, 5th Floor, Hilton Bldg., Quezon City, Philippines.

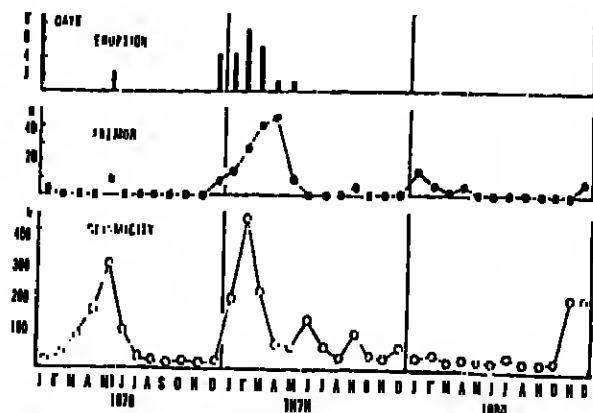


Fig. 3. Monthly numbers of days in which eruptions occurred (top), harmonic tremor events (center), and recorded earthquakes (bottom) at Tarumai, January 1978-December 1980.

#### Volcanic Activity in Nicaragua, El Salvador, and Guatemala-Late 1980

Geologists from Dartmouth College, the Instituto Geográfico Nacional de Guatemala, and the Instituto de Investigaciones Sísmicas de Nicaragua observed eight Nicaraguan, two Salvadoran, and two Guatemalan volcanoes between mid-November and early December. Dartmouth geologists provided the following report.

##### Nicaragua

**Carro Negro (12.52°N, 88.73°W).** Summit crater fumaroles remained at temperatures as high as 300°C. A small vapor plume was intermittently visible. Seismic activity had dropped from the high level of June.

**Costiguine (12.97°N, 87.58°W).** No fumarolic activity was visible from the rim.

**Lee Pikes (El Hoyo) (12.48°N, 88.88°W).** A small continuous vapor plume was still being emitted from the top of the kilometer-long crack in the summit.

**Mesaya (11.95°N, 86.15°W).** Emission of a very large gas plume has continued without interruption since fall 1979. Remote sensing of SO<sub>2</sub> revealed continued high-level flux, with 1500-2000 tons/day average for the entire year. The hole through the surface of the lava lake was larger than in previous years, and a great deal of sublimation was occurring around its edge. No lava or red glow was visible during daylight. Acid gas and rain continued to cause considerable damage downwind.

**Mombacho (11.83°N, 85.98°W).** A small intermittent plume was visible, rising from the southeast section of the summit.

**Momotombo (12.42°N, 88.55°W).** The summit crater fumaroles continued to be very hot, with temperatures measured up to 735°C and reported to >900°C. A small vapor plume continued, and remote sensing revealed very low rates of SO<sub>2</sub> emission. Portions of the crater were seen to glow red and orange when observed at night, with the highest temperatures on the steep south wall of the crater. No seismic activity has occurred recently at Momotombo.

**San Cristóbal (12.70°N, 87.02°W).** A moderate-sized vapor plume rose continuously from the summit. Remote sensing of SO<sub>2</sub> revealed increased flux since June 1980, but SO<sub>2</sub> emission remained far below the levels of the mid-1970's.

with interval of ½ hour to 4 hours between eruptions. Most eruptions lasted 2-3 min and sent ash and gas columns to heights of several hundred meters to 1 km above the vent. Five millimeters of ash accumulated at the foot of the dome over one 12-hour period. Eruptions occasionally threw 10-cm blocks several hundred meters and ejected tephra to well above the summit of Santa María. Although not directly observed, the plug dome and blocky lava flow that was seen being extruded from Caliente vent in February was apparently still very active. Large avalanches of glassy material could be heard from Caliente vents many times per hour. Debris from these avalanches was visible in the barranca below Santalegülo.

Information contacts: Richard E. Stolber, Stanley N. Williams, H. Richard Naslund, Lawrence L. Mellinco, and Mark Conrad, Department of Earth Sciences, Dartmouth College, Hanover, New Hampshire 03755.

Samuel Bonie, Instituto Geográfico Nacional, Avandadas Américas, 5-78, Zone 13, Guatemala City, Guatemala. Arturo Aburto and Douglas Fejardo, Instituto de Investigaciones Sísmicas, Apartado Postal 1781, Managua, Nicaragua.

##### Earthquakes

Date	Time, GMT	Magnitude	Latitude
Dec. 7	1737	5.7 M <sub>s</sub>	36.02°N
Dec. 17	1822	6.7 M <sub>s</sub>	49.41°N
Dec. 19	0117	6.1 M <sub>s</sub>	34.54°N
Dec. 22	1251	5.5 M <sub>s</sub>	34.38°N

Longitude	Depth of Focus	Region
1.23°E	10 km	northern Algeria
129.81°W	10 km	west of Vancouver Island, Canada
50.70°E	shallow	North central Iran
50.49°E	32 km	North central Iran

The Algeria event injured 20 persons in the El Asnam area, which was devastated by earthquake October 10 that killed thousands and left about 400,000 homeless. There were no reports of casualties or damage from the December 17 shock. The December 19 earthquake killed 26 persons. The nearby event 3 days later caused three deaths and 139 injuries, according to official reports.

Information contacts: National Earthquake Information Service, U.S. Geological Survey, Stop 987, Denver Federal Center, Box 25048, Denver, Colorado 80225 USA. United Press International. The Associated Press.

##### Earthquake Swarm

**Siquijor Island, Philippines.** A swarm of earthquakes began to be felt at Lazi, on the south coast of Siquijor Island, on December 17. By December 19, recorded events averaged 102 per hour, and several may have reached magnitude 4-5. Loud detonations reportedly accompanied the seismicity. The next day, 95 strong earthquakes were recorded, accompanied by more detonations, and about 5000 residents fled to nearby islands. Earthquakes continued, but in decreasing numbers, through the end of December.

Initial investigations by the Commission on Volcanology and others yielded epicenters about 1.7 km N35°E of Lazi, with depths of focus averaging 2.9 km. Event locations trended NNW. The commission believes that the seismicity was probably caused by movement along a normal fault in the east central part of the island. Seismic monitoring was continuing in early January.

Information contacts: John A. Wolfe, MCCPO, Box 1888, Makati, Metro Manila, Philippines.

Olimpio Peña, Acting Commissioner, Commission on Volcanology, 5th Floor, Hilton Bldg., Quezon Blvd., Ext., Quezon City, Philippines. United Press International.

##### Fireballs

**Western Australia, July 13, 1241 GMT (2041 Western Australia Standard Time).** David Dane saw a magnitude 10 violet-blue fireball from Belmont (near Perth). The object first appeared near alpha Capricornis. It left a blue train that persisted for 48 s.

Information contact: Robert A. Mackenzie, 26, Adrian Street, Dover, Kent CT17 9AT England.

**Western Australia, July 25, 1502 GMT (2302 Western Australia Standard Time).** John Leonard and Mrs. J. Hughes and family observed a brilliant fireball from Wembley and Gosnell (near Perth). The meteor traveled from the constellation Scorpius to the western horizon, where it disappeared behind a cloud bank. It was much brighter than the gibbous moon present in the sky at the same time, and it lit up the landscape, trees, and clouds. A train persisted for about 3 s.

Information contact: Same as above.

**Western Australia, August 3, 1555 GMT (2355 Western Australia Standard Time).** Craig Willoughby of Belmont (near Perth) observed a fireball that first appeared as a very slow, reddish, magnitude +2 object in Delphinus (alpha 314 delta +14°). After traveling about 10° of arc, it suddenly brightened to a dazzling white and increased in diameter to about 1/3° of arc. The meteor then continued through Capricorn, slowly fading before ending near gamma Grus (alpha 321°, delta -32°). A bright trail of light reached a magnitude estimated by Mr. Willoughby, an experienced observer, at -15, lighting the sky as if it were at. A train persisted for 35 s, noticeably distorted by upper atmosphere winds, before it disappeared.

Information contact: Same as above.

**Northern Italy, November 28, 1727 GMT.** Observer: Capt. Schweske, F/O and F/E of Lufthansa flight LH 303 (Rome-Munich). Location: 44.67°N, 11.38°E (10 km north of Bologna), aircraft course 030° magnetic, altitude 10.5 km. First sighting: 080° magnetic, 30° above the horizon. Last sighting: 030° magnetic, 5° above the horizon. Duration: 3-4 s. Magnitude: -7. Color: green. The object looked like a very bright green star with a tail slightly bent toward the earth. Information contact: Gerhard Pointsky, Universitäts-Sternwarte, Tierkenschanzstrasse 17, A-1180 Wien, Austria.

**New Hampshire, USA, December 12, about 0820 GMT (0320 Eastern Standard Time).** William D. Beel, Jr., of Jackson, New Hampshire, observed a brilliant meteor that traveled about 35° of arc from NNW to SSE in 8 s. The fireball began as a red streak, changed to an intense white streak for about half its path, then disintegrated into orange particles

that turned bluish-white. After an intense blue flash, the meteor disappeared above the horizon. Mr. Beel heard no sounds. Information contact: William D. Beel, Jr., Dundee Road, Jackson, New Hampshire 03846.

**Wyoming, USA, December 23, 0445 GMT (22 December, 2145 Mountain Standard Time).** A U.S. Geological Survey seismic net in Yellowstone National Park recorded an air shock similar in strength to a sonic boom but with an atypical arrival pattern. Using a speed of sound in air of 1/3 km/s, Andrew Pitt calculated a point of origin for the air shock at 20-km altitude over 44.53°N, 110.38°W (± several hundredths of a degree). In the Yellowstone Lake area. This point is ringed by seismic instruments, with the most distant to record the air arrival about 70 km away.

Several eyewitnesses in this sparsely populated area observed a brilliant fireball shortly before the air shock was recorded. In western Yellowstone Park, about 80 km from the calculated air shock origin point, a man with his back to the event saw the sky brightening, then turned to see a blue ball with some orange highlights fall vertically until it disappeared below the horizon. The ball was as brilliant as the light pro-

duced by arc welding. He heard a low rumble 2-4 min later. About 120-130 km to the north, a woman saw a white ball, about half the size of the full moon, falling on a path slightly east of vertical. The object had a blue-green tail about 3 times the length of the head. After it disappeared behind a ridge, she saw a bright flash. Persons in central Yellowstone noted a bright flash from indoors and heard sounds shortly thereafter. The North American Air Defense Command (NORAD) had predicted no reentries for this time and location.

Information contact: Andrew Pitt, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, California 94025. R. A. Hutchinson, Old Faithful Station, West Yellowstone, Montana 59758. NORAD/OIP, Peterson AFB, Colorado 80914.

**Wales, November 29, 2228 GMT.** David Powell of the Cardiff Astronomical Society observed a fireball, just below alpha Pegasus, moving slowly toward beta Cygnus. The object had a circular white head about 1/4 the diameter of the full moon. Powell estimated the fireball's magnitude at -8. He reported no train or sonic effects. Information contact: Robert A. Mackenzie, 26, Adrian Street, Dover, Kent CT17 9AT England. ☼

can thus very well be used in isolation from the rest of the book. The excellent, partly annotated, bibliography and the work examples elaborating on some details of topics either covered or only briefly mentioned in the text help to alleviate the weaknesses of some of the chapters.

Chamberlain's book is a valuable addition to the literature on planetary science, with most of the chapters representing lucid introductions to topics required for a thorough understanding of planetary atmospheres. The book is well produced, and there are remarkably few typographical errors (a list of the major ones is being supplied by the author). On the basis of its overall merit, I can highly recommend this book to everyone interested in, or working on, problems of the physics and chemistry of planetary atmospheres.

Siegfried J. Bauer is with the NASA/Goddard Space Flight Center in Greenbelt, Maryland.

#### New Listings

Items listed in New Publications can be ordered directly from the publisher; they are not available through AGU.

**Advances in European Geothermal Research.** A. S. Strub, P. Ungemach (Eds.), D. Reidel, Boston, Mass., xvi + 1086 pp., 1980, \$63.00.

**The Ancient Sun—Fossil Record in the Earth, Moon and Meteorites.** R. O. Pepin, J. A. Eddy, R. B. Merrill (Eds.), Pergamon, New York, xvi + 581 pp., 1980.

## EVOLUTION OF PHYSICAL OCEANOGRAPHY

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edited by Bruce A. Warren and Carl Wunsch

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**Also available:** **DEEPSEA MINING** edited by Judith Kidwell. "With the existing fuel shortage, and the large amount of publicity that it rightfully receives, relatively little public attention has been focused upon the depletion of our other natural resources. *Deepsea Mining* is an extremely successful compilation of expertly written articles that provide a worthwhile collection of the important issues in this area."—*Naval Engineers Journal* 251 pp. \$17.50.



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**Astronomy and Astrophysics Abstracts**, vol. 27, Literature 1980, Part 1, S. Böhm, U. Esser, W. Fricks, I. Heinrich, W. Hofmann, O. Krahn, O. Rose, L. D. Schmadel, G. Zeith (Eds.), Springer, New York, x + 939 pp., 1980, \$69.70.

**Brazilian Stone Meteorites**, C. B. Gomes and K. Kell, University of New Mexico Press, Albuquerque, N.M., v + 161 pp., 1981, \$20.00.

**Catalog of Tsunami Photographs—Key to Geophysical Records Documentation**, No. 13, J. B. Nelson, National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo., vi + 62 pp., 1980.

**The Coastal Almonac for 1980—The Year of the Coast**, P. L. Ringold, J. Clerk, W. H. Freeman, San Francisco, Calif., xvi + 172 pp., 1980, hardcover: \$19.95, paper: \$9.95.

**A Concise World Atlas of Geology and Mineral Deposits**, D. R. Derry, John Wiley, New York, 110 pp., 1980, \$61.95.

**The Conference on Satellite-Based Navigation and Remote Sensing of the Sea**, C. C. Tchemming (Ed.), Den Omske Nattekonferens for den internationale Union for Geodesi og Geofysik, Charlottenlund, Denmark, 122 pp., 1980.

**The Continental Crust and Its Mineral Deposits**, Spec. Pap. 20, D. W. Strangway (Ed.), Geological Association of Canada, Waterloo, Ontario, viii + 804 pp., 1980, \$30.00.

**Descriptive Regional Oceanography**, Pergamon Mar. Ser. vol. 3, P. Tchernie, Pergamon, New York, xviii + 253 pp., 1980.

**Developments in Petroleum Geology—2**, G. D. Hobson (Ed.), Applied Science Publishers, London, x + 345 pp., 1980, \$70.00.

**A Dynamic Stratigraphy of the British Isles—A Study in Crustal Evolution**, R. Anderson, P. H. Bridges, M. R. Lee, and B. W. Sellwood, George Allen & Unwin, Boston, Mass., x + 301 pp., 1979.

**The Future of American Agriculture as a Strategic Resource**, S. S. Belle and R. G. Hesly (Eds.), The Conservation Foundation, Washington, D.C., xv + 284 pp., 1980.

**General Oceanography—An Introduction**, 2nd Ed., G. Diehl, K. Kalle, W. Kreuss, G. Siedler, John Wiley, New York, xxi + 826 pp., 1980.

**Geochemistry of the Lithosphere**, A. A. Beus, MIR Publishers, Moscow, 366 pp., 1979, \$10.00.

## Marine Ecology

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**Geophysicist North Carolina State University—Raleigh.** The Department of Marine, Earth and Atmospheric Sciences invites applications for a presently available tenure track position in geophysics. Rank and salary are open, depending on qualifications and experience. A Ph.D. is required. Applied or exploration geophysics orientation are preferable; however, other specializations in geophysics also will be considered.

Primary responsibilities will include generating and conducting research programs as well as teaching graduate courses in geophysics. The department currently consists of 31 regular faculty members including 19 in the areas of geology and geophysics. Please send resume and names of three references to Prof. J. J. Van, Search Committee Chairman, Department of Marine, Earth and Atmospheric Sciences, North Carolina State University, Raleigh, NC 27650, USA. We hope to make a final decision prior to May 31, 1981.

North Carolina State University is an equal opportunity/affirmative action employer.

**Endowed Chair/Clemson University.** Applications are invited for the Charles Carter Newman Endowed Chair of Natural Resources Engineering. Applicants should have an earned doctorate in engineering and a proven teaching and research record in areas closely associated with natural resources. Applicant should possess sincere interest in the conservation and development of natural resources with concurrent environmental protection. The twelve-month position carries the title of professor of agricultural engineering. Starting salary is open.

Send application and resume to Dr. K. Webb, Head, Department of Agricultural Engineering, Clemson University, Clemson, SC 29631 before May 1, 1981.

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**Scientists/Meteorologists/Engineers.** Science Systems and Applications, Inc. (SSAI) has positions for programmers, analysts, scientists and engineers to engage in scientific modeling and data analysis activities in the areas of: 1. Plasma/ionospheric physics theoretical simulations 2. Atmospheric/oceanic sciences 3. Remote sensing and radiative transfer/scattering studies 4. Satellite data analysis 5. Weather/climate and severe storms studies 6. Atmospheric/ionospheric dynamics 7. Solar and planetary physics and astronomy 8. Computer image processing and systems displays 9. System software engineering 10. Nuclear fusion research and 11. Applied meteorology. These positions involve working with NASA/NOAA/NAVY scientists in metropolitan, Washington, D.C. area. A strong background in numerical simulations, and experience in working with large scale computers is a desirable entry level to senior scientist/engineer positions. SSAI provides a congenial academic environment, pays liberal fringe benefits and awards bonuses to its employees. Please send your resume with salary history and references to Science Systems and Applications Inc., The Aerospace Building Suite 140, 10210 Greenbelt Road, Seabrook, MD 20681.

**Structural Geologist/University of California, Santa Barbara.** Applications are invited for a tenure track appointment in structural geology to be filled during 1981-1982, subject to availability of funds. Rank dependent upon qualifications and experience, but preference will be given to the assistant professor level. Successful candidates must have a Ph.D. degree and strong desire and commitment to teaching and research. The successful candidate will be expected to develop a strong research program and obtain outside funding for its support. Additional duties may include teaching physical geology and summer field geology.

Please send resume and evidence of teaching and research proficiency, by March 31, 1981, and arrange for early submission of two letters of recommendation to Dr. Arthur G. Sylvester, Chairman, Department of Geological Sciences, University of California, Santa Barbara, CA 93106, (805) 991-3159. The University of California is an affirmative action equal opportunity employer.

**Faculty Positions in Geology/University of Alabama.** The Physics Department of the University of Alabama invites applications for two tenure track positions expected to be available August 1981. Rank and salary are to be commensurate with experience and training. The department has a policy of encouraging research activities in applied areas which are of mutual interest to the faculty and the local technical community. Candidates with background in computational physics, acoustics, and geophysics are especially encouraged to apply. Current research activities within the department include experimental atomic and molecular physics, solid state physics, cryogenic geophysics, hydrodynamics, and computational physics.

Applicants should send a resume to Edward L. Beeson, Chairman, Physics Department, University of Alabama, 880 University Blvd., Birmingham, AL 35284, prior to May 1, 1981. The position will be available September 1981.

The University of Alabama in Birmingham is an equal opportunity/affirmative action employer.

**Geochronology/Brillite Deformation, University of New Brunswick.** The Department of Geology has a tenure track position available from July 1, 1981 as assistant professor or higher level. The successful applicant will be expected to teach both undergraduate and graduate as well as carrying out research and supervising graduate students.

Applications will be accepted in the following fields: geochronology of ore bodies, exploration, environmental or soil geochemistry, jetted deformation, rock mechanics or clay engineering.

Applicants should have a Ph.D. and preferably postdoctoral experience. Applications including a curriculum vitae and names of three references should be sent to P. F. Williams, Chairman, Department of Geology, University of New Brunswick, Fredericton, N.B. E3B 6A3.

### Physical Oceanographer/Geophysical Fluid Dynamist

Atlet Associates, a growing research firm located in Southern California, engaged in theoretical and applied physical oceanography, is offering permanent, full-time positions. Candidates require Ph.D. (or equivalent experience) in physical oceanography or geophysical fluid dynamics. Salaries are commensurate and negotiable, based on qualifications. Atlet offers a fringe benefit package of superior quality. Qualified candidates should send resume, salary history, and list of professional references to:

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**Research Positions Utah State University.** Positions are invited for the position of assistant professor or associate professor (tenure or research track), starting July 1, 1981. Applicants should have a Ph.D. in civil engineering or related sciences and demonstrated research ability in the mathematical modeling of water quality and quantity systems (deterministic and stochastic methods to hydro quality modeling and ground water analysis), with interest in strictly control applications. Responsibilities include: preparing proposals, directing research, testing and conducting short courses. Salary range from \$23,000 to \$32,000 (12-month base), commensurate with qualifications and experience. Application deadline is April 1, 1981. Send resume and names and addresses of three references to: Dr. Douglas James, Director, Utah Water Research Laboratory, UMC 82, Utah State University, Logan, Utah 84322.

Utah State University is an affirmative action/equal opportunity employer.

**Oceanographic Meeting Technicians.** The Marine Science Program at North Carolina State University (Raleigh) is expanding its oceanographic technical services group and is currently seeking a technician familiar with the design and deployment of deep-sea current meter mooring arrays, as well as with standard shipboard oceanographic sampling techniques.

Qualifications include a degree in science or engineering with some electronics background and two years field experience or an equivalent combination of education and experience. Salary commensurate with education and experience. Send resume and names of references to Personnel Services, North Carolina State University, P.O. Box 8067, Raleigh, NC 27650.

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**Hydrogeologist.** An outstanding career opportunity with excellent potential for advancement is currently open for a top professional interested in applied research. Duties will include planning, design and conducting broad-based groundwater resources investigations. Specialization in geochemistry including expertise derived from academic training or experience in hydrochemistry will be considered an asset. Demonstrated ability to plan and execute programs to study the evolution of hydrologic processes in groundwater flow systems, including the movement of pollutants through granular or fractured rocks, is required. Good writing ability is a must. District facilities include sophisticated geophysical logging equipment, chemistry laboratory and in-house computer and publishing facilities. Excellent fringe package. Minimum entrance salary \$18,350 per annum depending on training and experience. Minimum qualifications include M.S. in hydrogeology or geochemistry or equivalent training and experience. Interested and qualified professionals are encouraged to apply to Personnel, South Florida Water Management District, P.O. Box 371, West Palm Beach, FL 33402. Equal opportunity employer.

**Exploration Geophysicist/University of Oklahoma.** The School of Geology and Geophysics at the University of Oklahoma will hire an experienced exploration geophysicist to fill the Frank and Betty Schultz Professorship, and is seeking nominations and applications for the position. The person must be a distinguished scientist who has made important contributions to exploration geophysics through research. Preference will be given to a scientist whose specialty is seismic properties of earth materials and who has earned the Ph.D. The Schultz Professorship is a quality teaching and research position and will provide leadership and guidance in establishing a quality teaching and research exploration geophysics group. The University of Oklahoma has recently made a strong commitment to the earth sciences with the establishment of a College of Geosciences, to be housed in a new building. The School of Geology and Geophysics will expand from its present faculty of 16 to 26 faculty members by 1986. This will include three scientists in the exploration geophysics area, five in structural-tectonophysics-solid earth geophysics and others in stratigraphy-paleontology, geochemistry, petrology, and energy resources.

Applications are due April 30, 1981. Inquiries, nominations, and applications should be sent to John Wickham, Director, School of Geology and Geophysics, University of Oklahoma, Norman, OK 73019.

The University of Oklahoma is an equal opportunity employer.

**Postdoctoral Position/Earth and Space Sciences Institute.** To assist in analysis and interpretation of data from the Voyager Ultraviolet Spectrometer. Possible fields of research include the bound and extended atmospheres of Jupiter, Saturn, and Titan. Applicants should have a Ph.D. and expertise in several of the following areas: atmospheric physics, plasma physics, atmospheric chemistry, interactions, computer programming and simulation, and UV spectroscopy in the laboratory or space. Initial appointment for one year with the possibility of extension. Applicant should send resume, list of publications, and names of three references to Bill R. Sundell, Earth and Space Sciences Institute, University of Southern California, 3625 East Ajo Way, Tucson, Arizona 85713.

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**Virginia Polytechnic Institute and State University.** Igneous Petrology and Geochemistry Research Associates. Origin and tectonic significance of granitic rocks. Project involves petrography, analytical chemistry, mineral chemistry, isotopic studies, and field mapping. Send resume to: D. R. Worres, Chairman, Department of Geological Sciences, Virginia Poly. Inst. and St. Univ., Blacksburg, VA 24061.

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**Faculty Appointment/Colorado State University.** The Department of Earth Resources, Colorado State University invites applications for a tenure track appointment with emphasis on active research experience in remote sensing, and an interest in teaching graduate and undergraduate students beginning September 1981. The candidate is expected to have a Ph.D. degree in geology, watershed sciences or in a related field and is expected to develop and maintain a vigorous research program with special emphasis on the application of state-of-the-art remote sensing techniques to the investigation of natural resource phenomena. The candidate is expected to teach undergraduate and graduate courses in the application of remote sensing to natural resources.

Rank and salary are open and dependent on experience and qualifications of the applicant.

Applicants are invited to submit curriculum vitae, three letters of reference and a letter describing research and teaching interests to Dr. H. S. Boyne, Department of Earth Resources, Colorado State University, Fort Collins, Colorado 80523 (303) 461-5286.

Deadline for receipt of applications is April 15, 1981.

CSU is an EOE/AA. E.O. Office: 314 Student Serv. Bldg.

**Research and Data Systems, Inc./Scientific Programmers and Programmer Analysts.** Immediate openings for persons with B.S. in science or math and at least two years experience with FORTRAN or PLI on IBM systems. Work involves data processing and analysis from satellite based remote sensing systems. Experience with time sharing systems preferred. Also have openings for staff scientists with strong programming background. Send resume in confidence to Research and Data Systems, Inc., 9420 Annapolis Road, Lanham, MD 20801. Telephone: (301) 459-0001.

**Geophysicist.** The Geology Department at the University of Southwestern Louisiana in Louisiana, Louisiana invites applications for an anticipated research/teaching opening in geophysics. Responsibilities will include one-half time in seismic investigation of geopressed geothermal reservoirs of South Louisiana and one-half time teaching geophysics and supervising graduate students. The successful applicant will be familiar with exploration seismic data acquisition, processing, and interpretation. The Ph.D. or Masters with experience, is required. Salary range is \$23,000 to \$35,000 per 12 month.

The position is expected to be filled in the Spring of 1981 or as soon as possible thereafter.

To apply please direct a resume, three letters of recommendation, and other pertinent materials to: Dr. Gary L. Kinsland, Geology Department, University of Southwestern Louisiana, Lafayette, LA 70504.

**Van Braun Post-Doctoral Fellowship in Space Physics/University of Alabama in Huntsville.** Appointment effective September 1981 in a tenure track position with reduced teaching load during the first two years. Research specialty in astrophysics, planetary science or solar terrestrial physics. Research support available from NASA and Redstone Arsenal. Salary competitive. Recent Ph.D.s are invited to send resumes, research plans and names of four references to: Van Braun Fellowship Committee, Office of Academic Affairs, University of Alabama in Huntsville, AL 35899.

Equal opportunity in education and employment.

**Glaciology/University of Washington.** The University of Washington seeks applications for a tenure track position with the individual to be appointed as assistant professor in the Department of Atmospheric Sciences and Geophysics program. Principal research interest of candidates should be directed toward geophysical or climate related study of snow or ice. Candidates specializing in physical processes in snow are of particular, but not exclusive, interest. All applicants should be committed to graduate level teaching, research advising, and innovative research emphasizing advanced experimental methods and rigorous physical analysis. Duties will include teaching one or two undergraduate courses per year in atmospheric sciences. The appointment starts in September 1981. A Ph.D. is required. For additional information contact C. F. Raymond (206) 543-4914. Interested persons may send a resume and four letters of recommendation to Professor R. T. Merrill, Geophysics Program AK-60, University of Washington, Seattle, WA 98195.

Deadline for applications is March 31, 1981.

An equal opportunity/affirmative action employer.

**Program Manager/Meteorology.** Oceanographic Services, Inc., is seeking qualified applicants for the position of program manager for meteorological studies. Applicants should have an M.S. or Ph.D. in meteorology or atmospheric sciences, plus experience in the field. A broad general knowledge of air pollution, and an understanding of the air pollution regulatory environment, is helpful. Interested persons should send resume, references, and a salary history to R. C. Banta, Oceanographic Services, Inc., 22 Castilian Drive, Gales, CA 93117.

**Acadia University.** The Department of Geology, Acadia University, is seeking a head, beginning July 1, 1981. Preference will be given to applicants with experience and research interests in petroleum geology and related fields and/or energy resources. Rank and salary will be appropriate to qualifications. The successful candidate will assume leadership of an established, vigorous and growing department with five faculty members, and over 100 B.Sc. and M.Sc. candidates. Responsibilities include teaching at undergraduate and graduate levels, and academic planning and development in the specialty area.

A letter of application together with a curriculum vitae and names of three referees should be sent by March 15, 1981 to Dr. Emeel E. Zick, Dean of Science, Acadia University, Wolfville, N.S., B0P 1X0.

**Structural Geologist.** The Department of Geosciences of Purdue University invites application for a tenure track faculty position in structural geology, starting in August 1981. Rank and salary will be commensurate with qualifications. A Ph.D. is required. The individual will be expected to teach undergraduate and graduate courses in structural geology and tectonics, participate in summer field courses, and pursue an active research program.

Preference will be given to a candidate with an applied field orientation and a strong background in the quantitative analysis of field data. The department has active programs in petrology, geophysics, and engineering geology and has a close working relationship with the geotechnical group in civil engineering.

Closing date for application is April 1, 1981. Applicants should send a resume, the names, addresses, and telephone numbers of three references, and a brief statement of research interests to R. H. McCallister, Department of Geosciences, Purdue University, West Lafayette, IN 47907.

Purdue University is an equal opportunity/affirmative action employer.

**Staff Scientist/Ocean Margin Drilling Program.** Joint Oceanographic Institutions, Inc. (JOI, Inc.) has immediate openings for two staff scientists to fill the positions of:

Field Program Coordinator  
Downhole Measurements Coordinator

In its Ocean Margin Drilling (OMD) Science Programs Office, Individuals filling each of these positions will report to the OMD Chief Scientist. They will be required to provide staff support to advisory committees in their areas of concern, and will be responsible for implementing programs recommended by the OMD Science Advisory Committee, and for the oversight of the performance of individuals or groups under contract to JOI. Both positions require a Ph.D. in an appropriate area of earth science and appropriate experience. The OMD is funded for FY 81.

Initial appointment will be for a period of two years with the second year contingent upon the availability of funds. The positions may be filled on a rotating basis. Salary will be competitive. Send resume statement of interest, and the names of three referees to Thomas A. Davies, Chief Scientist, Ocean Margin Drilling Program, Joint Oceanographic Institutions, Inc., 2600 Virginia Ave., NW, Suite 512, Washington, DC 20037. The deadline for applications is February 20, 1981, or as soon thereafter as suitable candidates are found.

**VEN BRAUN POST-DOCTORAL FELLOWSHIP IN SPACE PHYSICS/University of Alabama in Huntsville.** Appointment effective September 1981 in a tenure track position with reduced teaching load during the first two years. Research specialty in astrophysics, planetary science or solar terrestrial physics. Research support available from NASA and Redstone Arsenal. Salary competitive. Recent Ph.D.s are invited to send resumes, research plans and names of four references to: Van Braun Fellowship Committee, Office of Academic Affairs, University of Alabama in Huntsville, AL 35899.

Equal opportunity in education and employment.

**Glaciology/University of Washington.** The University of Washington seeks applications for a tenure track position with the individual to be appointed as assistant professor in the Department of Atmospheric Sciences and Geophysics program. Principal research interest of candidates should be directed toward geophysical or climate related study of snow or ice. Candidates specializing in physical processes in snow are of particular, but not exclusive, interest. All applicants should be committed to graduate level teaching, research advising, and innovative research emphasizing advanced experimental methods and rigorous physical analysis. Duties will include teaching one or two undergraduate courses per year in atmospheric sciences. The appointment starts in September 1981. A Ph.D. is required. For additional information contact C. F. Raymond (206) 543-4914. Interested persons may send a resume and four letters of recommendation to Professor R. T. Merrill, Geophysics Program AK-60, University of Washington, Seattle, WA 98195.

Deadline for applications is March 31, 1981.

An equal opportunity/affirmative action employer.

**Statistical Techniques for Data Generation and Forecasting in Hydrology and Water Resources.** July 8 to July 10, 1981. Fee: U.S. \$525.00.

Contact: Dr. Jose D. Sales, Course Director, Engineering Research Center, Colorado State University, Fort Collins, Colorado 80523, USA. Telephone: (303) 461-6460, Telex: 910 930 9000, ENGR CSU FTCL.

Lectures include: Univariate and multivariate modeling of hydrologic time series, AR and ARMA models, disaggregation modeling of single and multiple series, statistical techniques for forecasting, Kalman filtering estimation techniques and computer programs.

Lecturers are: Dr. R. Bras (M.I.T.); Dr. J. Delisle (Purdue University); Dr. W. Lane (U.S.B.R.); and Drs. V. Yevjevich, D. Boes, J. Labadie, and J. Sales (Colorado State University, Lakeland).

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# AGU

## Meteorology Section Considers New Name

The AGU Meteorology Section business meeting was held at the Jack Trax Hotel, December 9, during the AGU Fall Meeting in San Francisco. The principal item discussed at the half-hour meeting was the proposal made by several members that consideration be given to renaming the section 'Atmospheric Science'. The members present felt the proposed name would better serve the strong physical, chemical, and electrical constituencies now in the Meteorology Section. There was also some indication that those now in the SPR: Aeronomy Section would be interested in joining a revamped Atmospheric Science Section.

The consensus of the meeting was that this issue be pursued further by the officers of the Meteorology Section with other appropriate officials of AGU. The possibility of forming a small committee to define this proposal more precisely was also favored by the attendees.

Those attending were Tommy Augustsson, Old Dominion University; Bill Boeck, Niagara University; Jack Flehman, NASA/Langley; T. E. Graedel, Bell Laboratories; Joel S. Levine, NASA/Langley; Stan Ruttenberg, NCAR; Russ Schnell, NOAA/ARL; Rich Stolarik, NASA/Goddard; Ron Taylor, NSE; and Jay S. Winston, NDA/NWS.

Jay S. Winston, Secretary  
Meteorology Section

## Candidates for JGR-Blue Editor Sought

George L. Siscoe will complete his term as editor of the *Journal of Geophysical Research*—Blue at the end of 1981. A selection committee, chaired by Norman F. Ness, has been appointed to recommend candidates to the AGU president. Nominations for the editor for the space sciences section of JGR for the term 1982-1985 are now being accepted. Those who are interested in serving as editor, or who wish to suggest candidates, should send recommendations by April 15 directly to

American Geophysical Union  
2000 Florida Avenue, N.W.  
Washington, D.C. 20009  
Attention: JGR Search Committee

## Meetings

### Indonesia Plans Krakatau Commemoration

To commemorate the 100th anniversary of the August 27, 1883 eruption of Mount Krakatau, the Indonesian Institute of Sciences (LIPI) is sponsoring a 2-year program of expeditions and research that will culminate in a symposium on or about August 27, 1983.

The scientific activities and the symposium will center on volcanology and geology, marine and terrestrial biology, oceanography, and social aspects related to the Mount Krakatau eruption which left 36,000 people dead. Scientists and institutions wishing to participate in the program and the concluding seminar should submit their proposals directly to LIPI, J.L. Teuku Chik Dillio 43, Jakarta, Indonesia, attn: Didi Sestraradja, Deputy Chairman for Natural Sciences.

### Volcanics in the Atmosphere

A session on the role of volcanic emissions in atmospheric chemistry will be held during the IAGP Third Scientific Assembly in Hamburg.

Contributed papers are wanted for the special session, slated for August 21 and 22. Topics desired include those concerning mechanisms of volcanic emissions, experimental data and fluxes of gaseous and particulate matter to the atmosphere, the late of volcanic products in the atmosphere, and the possible effects on the physics and chemistry of the atmosphere and future climate changes.

Abstracts should be sent to S. Ruttenberg, Secretary General of IAGP, NCAR, P.O. Box 3000, Boulder, Colorado 80307; deadline is March 2. Copies of the abstracts should also be sent to co-convenors Gerard Lambert, at Centre des Faibles Radioactivités, Domaine du C.N.R.S., F 91190 Gif-sur-Yvette, France; and John W. Winchester, Department of Oceanography, Florida State University, Tallahassee, Florida 32306.

## Baltimore AGU Spring Meeting May 25-29

### Call for Papers

Abstract Deadline: March 4

Abstracts must be received at the AGU office by 5 P.M. on March 4 to be on time. Late abstracts (1) may be summarily rejected by program chairman, (2) may not be published in advance of the meeting, and (3) if accepted, will be charged a \$25 late fee in addition to the regular publication charge.

### General Regulations

Abstracts may be rejected without consideration of their content if they have not been received by the deadline or are not in the proper format. Abstracts may also be rejected if they contain material outside the scope of AGU activities or because they contain material already published or presented elsewhere. ONLY ONE CONTRIBUTED PAPER BY THE SAME FIRST AUTHOR WILL BE CONSIDERED FOR PRESENTATION; additional papers (unless invited) will be automatically rejected.

Only AGU members may submit an abstract. The abstract of a nonmember must be accompanied by a membership application form (with payment), or it must be sponsored by an AGU member.

A publication charge of \$40.00 for each contributed abstract will be invoiced (\$20.00 if the first author is a student member and if the appropriate notation is made on the abstract when submitted.) Both invited and contributed papers are subject to the publication charge unless specifically waived in writing. To repeat, the abstract must be received at AGU by March 4 to avoid an additional \$25.00 charge. If a

revised version of an abstract must be published, it will also be assessed a \$25.00 charge.

Authors will be notified by mail in late April of the status of their papers. Receipt of all papers will be acknowledged.

Ten minutes is normally allowed for the presentation of each contributed paper, and only 2" x 2" (35-mm) slide projectors and viewgraphs are usually available as standard equipment at the meeting. All other equipment is available at cost plus a \$10.00 billing charge if we have to invoice.

### Instructions for Preparing Meeting Abstracts

The abstract page is divided into two parts: the abstract itself and the submittal information. Follow the instructions for both carefully. Please use a carbon ribbon to type the material, and do not exceed the maximum dimensions of the abstract: 10.4 cm by 20 cm. Abstracts that exceed the noted size limitations will be trimmed to conform to the proper dimensions.

The meeting program will be prepared by photographing the abstracts exactly as they are received. Use the model abstract to prepare the final version. Submission of an abstract for an AGU meeting is presumed to carry with it permission for AGU to reproduce the abstract in all editions of *Eos* and in the programs and reports relating to the meeting; it is also presumed to permit the free copying of those papers. Although *Eos* is a copyrighted journal, authors are not requested to transfer copyright; copyright, where it exists, will be reserved by the authors.

### Submittal Information

Numbers refer to the items in the submittal block on the sample abstract.

- Title of meeting.
- Identification. (Only members may submit an abstract; this includes invited authors.)—Type identification number of one member author (ID number is the line consisting of 4 letters followed by 8 digits; see member's mailing label on *Eos* or journal) or if no author is an AGU member, type the ID number of the member sponsor. (Sponsor's name must also appear on the abstract at the end of the author portion.) If no ID number is given, a membership application and dues payment must accompany the abstract. Call AGU Member Programs (202-462-6903) immediately if you need an application.
- Corresponding address.—Give complete address and phone number of author to whom all correspondence (acknowledgment and acceptance letters) should be sent. Abbreviate as much as possible.
- Section of AGU to which abstract is submitted.—Use letter abbreviations of one of the following: G (Geodesy), GP (Geomagnetism and Paleomagnetism), H (Hydrology), M (Meteorology), O (Oceanography), P (Planetary), S (Seismology), SA (Aeronomy), SM (Magnetospheric Physics), SC (Cosmic Rays), SS (Solar and Interplanetary Physics), T (Tectonophysics), VGP (Volcanology, Geochemistry, and Petrology), U (Union).
- Type title of special session (if any) to which submittal is made.
- Indicate your preference for a particular kind of presentation by one of the following letters: O for oral, P for poster. The chairman may assign your paper to either of these types of presentation in order to fit the program plan.
- Percent of material previously presented or published, and where.

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  - If student member is the first author, the student publication rate is applicable. Indicate student rate applicable.
- Indicate whether paper is C (contributed) or I (invited). If invited, list name of inviter.

Sample Abstract

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### Special Sessions

Geodesy  
Realization of a Conventional Terrestrial Reference System

Geomagnetism and Paleomagnetism  
MAGSAT

Electromagnetic Induction Studies and Mantle Conductivity

Geomagnetic Field Intensity Fluctuations During the Last 10,000 Years and Their Effects on Radiocarbon Production in the Atmosphere

### Hydrology

John Ferri Symposium on Groundwater Hydrology  
Water Pollutes and Ground Water  
Symposium on the EPA-USGS National Urban Runoff Program

Trace Organics in Groundwater

Public Water Supply

What Geochemistry Can Tell Us About Background Water Quality

The Efficacy of Modeling in Water Resources Planning and Management

Acid Rain: Assessment and Impact

Water: A Constraint on Synthetic Fuel Development?

Wetlands: A Threatened Resource

Desalination: Imagined or Real?

### Planetary

Geological Processes on Icy Bodies (cosponsor: Tectonophysics)

### Selenology

New Frontiers in Earth Structure: Anisotropy, Scattering, and Q

Reflection and Refraction Selenology: Theory and Observation

### SPR-Aeronomy

Field-Aligned Currents (cosponsor: SPR—Magnetospheric Physics, POSTER SESSION)\*

History of Spectroscopy\*

SPR-Cosmic Rays & SPR-Solar and Interplanetary Physics

Solar Flare Particle Acceleration

Solar Flare Particle Composition

Waves and Turbulence in the Solar Wind\*

SPR-Magnetospheric Physics

Waves, Instabilities and Turbulence in Space Plasmas (POSTER SESSION).

Auroral Potential Structure\*

### Tectonophysics

Tectonics of Venus and Earth: A Comparison (cosponsor: Planetary and Geodesy).

Large-Scale Thin-Skin Tectonics (cosponsor: Seismology).

Illinois Deep Hole Project

Volcanology, Geochemistry, and Petrology

Silicate Melt Structure and Processes of Crystallization in Igneous Rocks

Precambrian Evolution of the Earth (cosponsor: Planetary and Tectonophysics).

SEASAT (cosponsors: Oceanography, Meteorology, and Geodesy).

\*Additional Special Sessions

### Session Highlights

#### Geomagnetism and Paleomagnetism

Electromagnetic Induction Studies and Mantle Conductivity. A special one-day session will be devoted to electromagnetic induction studies at the deep crust and upper mantle at sea and on land. Interaction of active scientists in the field with those making laboratory conductivity measurements will be emphasized. Interested persons are invited to contact Alan D. Cheve, Geological Research Division A-020, Scripps Institution of Oceanography, La Jolla, CA 92093.

Geomagnetic Field Intensity Fluctuations During the Last 10,000 Years and Their Effects on Radiocarbon Production in the Atmosphere. A considerable amount of paleomagnetic work has recently been done on radiocarbon-dated lava flows, lake sediments, and archeological material. As a result, certain models have been questioned by some workers. This has important ramifications for the correction to be applied to radiocarbon ages of all material datable by this method.

#### Planetary

Geological Processes on Icy Planetary Bodies (cosponsor: Tectonophysics). This special session will deal primarily but not exclusively with the Jovian satellites Europa, Ganymede, and Callisto. The submission of abstracts on geological characteristics and physical processes of surface and interior evolution is invited. For more specific information, contact E. M. Parmentier, Department of Geological Sciences, Brown University, Providence, RI 02912.

#### Tectonophysics

Tectonics of Venus and Earth: A Comparison (cosponsor: Planetary and Geodesy). The recent Pioneer mission to Venus has provided global information on the topography of Earth's twin planet and data on its gravity and magnetic fields. This special session will emphasize characterization of Venus and comparison with Earth. Specific emphasis will be on description, comparison, and interpretation of surface topography, lithospheric structure and evolution, thermal models, and gravity and magnetic fields. Organizer: James W. Head, Department of Geological Sciences, Brown University, Providence, RI 02912.

Large-Scale Thin-Skin Tectonics (cosponsor: Seismology). This following are subjects expected to be addressed in this session: large-scale detachments; sedimentary/accretionary wedges (including some that may contain large allochthonous crystalline sheets); reactivation of passive, Appalachian-type margins; Paleomagnetic and other evidence for microcontinental and exotic blocks, and modes of their emplacement; continental growth by accretion; and

implications for resource potential in overthrust belts. Some of the questions we wish to address in this session are: (1) Where and how widespread are large-scale detachments? (2) How do they affect the tectonics at plate boundaries and intraplate regions? (3) How are detachment structures formed? Can they persist as weakness zones through long geologic times? What are tectonic conditions for their reactivation? (4) What are the mechanisms of detachment slip, i.e., the rheologic and physical processes associated with active detachment structures? For additional information, contact Leonardo Sestier, Lamont-Doherty Geological Observatory, Palisades, NY 10964.

Illinois Deep Hole Project. Continuous core from three privately drilled deep holes in northern Illinois and secess to one of these holes (1.6 km deep) were made available for scientific investigations through a steering group established in February 1980 by the U.S. Geodynamics Committee. The principal emphasis in the study of these deep holes, which penetrated about 1 km of Precambrian granite, was an integrated investigation of surface and in-hole experiments, as well as detailed petrologic and physical properties studies of the core samples. This special session will report on the results of some of these studies.

The in-hole experiments included in situ stress (hydrofracture) and permeability measurements as well as a complete suite of geophysical logs carried out to correlate with core studies. Core analysis includes investigations of the mineralogy, petrology, chemistry, ages, isotopic geochemistry, and geophysical properties of the rock. Surface geophysical investigations were conducted to delimit the extent of the pluton that was drilled into by the holes. (Organized by Bezael Heimann, University of Wisconsin, Madison.)

### Volcanology, Geochemistry, Petrology

Precambrian Evolution of the Earth (cosponsor: Planetary and Tectonophysics). The purposes of the sessions are to bring together researchers in fields that bear on the development of the earth as a physical and chemical system and to integrate the ideas and data on terrestrial evolution from both the comparative planetary and earth-oriented approaches. The subject matter will include accretion and initial chemical segregation, thermal development, chemical and isotopic evolution, and tectonics of the atmosphere. Some papers will be invited but contributed papers are most welcome. For further information, contact the session organizers: Frank Eichler, Department of Geophysical Sciences, University of Chicago, Chicago, IL 60637 (312/753-8118), and Kevin Burke, Department of Geological Sciences, State University of New York, Albany, NY 12222 (518/457-3974).

Silicate Melt Structure and Crystallization Kinetics. This session will bring together researchers in the fields of silicate melt structure and melt crystallization kinetics to review recent development in these fields and to present new data. The topics to be discussed include investigation of melt structure by Raman and X ray spectroscopy and the investigation of the processes of nucleation and growth in both experimental and natural systems. Some papers will be invited, contributed papers are most welcome. For additional information, contact the session organizer, R. James Kirkpatrik, Department of Geology, University of Illinois, Urbana, IL 61801 (217/333-7414).

SEASAT (cosponsors: Oceanography, Meteorology, and Geodesy).

Additional Special Sessions

### Geodesy/Meteorology/Oceanography

Description of SEASAT Sessions. The SEASAT session will emphasize scientific investigations that utilize data from the SEASAT satellite in the disciplines of oceanography, meteorology, geodesy and glaciology. Reports on novel algorithm development work that demonstrates significant improvements in geophysical extraction also are welcome.

### Notice to SPR Section From President Norman Nea

We will carefully adhere to the standing rule of the AGU that an author may submit only one contributed paper at each meeting. The spirit of this rule is also meant to preclude groups of authors permuting their names on several papers to be presented in series so as to obtain more time. The program chairpersons of SPR will reject abstracts, or combine them if appropriate, in order to eliminate abuse of this rule. Please note price change for SPR section luncheon: Cost per ticket, \$3.50 (due to subsidy). See *Eos*, vol. 62, January 27, p. 39, for registration forms.

### Travel Grants to IAGA and IAGP Scientific Assemblies

AGU has applied to the National Science Foundation for grants to assist the travel of individual U.S. scientists to the Fourth Scientific Assembly of the International Association of Geomagnetism and Aeronomy, to be held in Edinburgh, Scotland, August 3-15, 1981, and the Third Scientific Assembly of the International Association of Meteorology and Atmospheric Physics, to be held in Hamburg, Germany, August 17-28, 1981. Application forms for the grants are available from

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### Deadline for Applications: April 1

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